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APPLICATION NO	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.

EXAMINER	
ART UNIT	PAPER NUMBER
	17

DATE MAILED:

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.	Applicant(s)
09/397,814	Zhong-Cheng Hu
Examiner	**Art Unit**
Daniel S. Metzmaier	1712

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *three* MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) X Responsive to communication(s) filed on *Jul 20, 2001* .

2a) X This action is **FINAL.** 2b) ☐ This action is non-final.

3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

Disposition of Claims

4) X Claim(s) *1-10, 12-48, 50, and 51* is/are pending in the application.

4a) Of the above, claim(s) _____ is/are withdrawn from consideration.

5) Claim(s) _____ is/are allowed.

6) X Claim(s) *1-10, 12-48, 50, and 51* is/are rejected.

7) Claim(s) _____ is/are objected to.

8) Claims _____ are subject to restriction and/or election requirement.

Application Papers

9) The specification is objected to by the Examiner.

10) The drawing(s) filed on _____ is/are objected to by the Examiner.

11) The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved.

12) The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

13) Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

a) All b) Some* c) None of:

1. Certified copies of the priority documents have been received.
2. Certified copies of the priority documents have been received in Application No. _____ .
3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

*See the attached detailed Office action for a list of the certified copies not received.

14) Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

15)	Notice of References Cited (PTO-892)	18)	Interview Summary (PTO-413) Paper No(s).
16)	Notice of Draftsperson's Patent Drawing Review (PTO-948)	19)	Notice of Informal Patent Application (PTO-152)
17)	Information Disclosure Statement(s) (PTO-1449) Paper No(s).	20)	Other:

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 1-10, 12-48 and 50-51 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The independent claims set forth a ratio of organic solvent to water but fail to define the units of said ratio, eg., wt/wt or vol/vol. Water has a density of 1 gm/ml. Organic solvents vary from solvent to solvent. When the units of a ratio are not set forth, the different types of ratios may vary. An example is acetone which has a density of 0.788 gm/ml. A ratio based on weight (wt/wt) would differ from a ratio based on volume (vol/vol) by about 20 % different in the amount of acetone in said composition. Applicants have further amended said ratio to avoid the prior art by fail to adequately define said ratio which is specifically asserted to be different from the prior art.

Please note Hu et al at page 97, Fig. 13 wherein the organic solvent to water ratio is defined as a volume ratio.

Claim Objections

3. Claims 13-14 and 31-32 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form.

The independent claims define a temperature range of "less than 90° C". The dependent claims define a temperature range of "from about 20° C to about 90° C" of "from about 22° C to about 90° C" which is a broader statement than a temperature range of "less than 90° C". Specifically, "less than 90° C" does not include "90° C" while "about 90° C" includes "90° C" and values slightly above "90° C".

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless --
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 43-48 and 50-51 are rejected under 35 U.S.C. 102(b) as being anticipated by Y. T. Moon et al., "Preparation of Monodispersed and spherical Zirconia Powders by Heating of Alcohol-Aqueous Salt Solutions", J. Am. Ceram. Soc., 78(10): 2690-2694 (1995). Y.T. Moon discloses methods of making monodispersed ZrO_2 from zirconyl chloride solutions.

Moon (page 1103) discloses 0.2M salt solution, R/H (alc/water vol. Ratio) ranges from 2 to 5. Figures 2 and 3 clearly show temperatures within applicants range of claims 13 and 14. Moon (micrographs, Fig 4-6) show nanosized particles.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made

7. Claims 1-3, 7-10, 12-18, 22-23, 25-29, 31-35, 37-40, 42-44, and 46-48 are rejected under 35 U.S.C. 103(a) as being unpatentable over M. Z.C. Hu et al., "Nucleation and growth for Synthesis of Nanometric Zirconia particles by Forced Hydrolysis", J. of Colloid and Interface Science, 198:87-99 (1998)[1]. M. Z.C. Hu et al (page 88, Materials and Method et seq) discloses methods of making nanoparticles by mixed solvent nucleation and growth of zirconia particles.

Hu et al <u>differ</u> from the claims in the temperature range for the hydrolysis or a single process employing the temperature and solvent to water ratios.

Hu et al (page 95) teaches the relationship between effective hydrolytic diameter and temperature for particular systems including a temperatures of 90° C for incubation. Specifically, the particle growth rate increases with increasing temperature.

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[1]M.Z.C. Hu et al. was published in February 1998 in vol. 198, No. 1 of J. of Colloid and Interface Science and therefore has a publication date which qualifies its date as prior art under 35 USC 102(b)

Hu et al (pages 97 and 98, Figures 13 and 14) teaches a 1/1 volume ratio of organic solvent to water. Hu et al (page 98, Summary) recognizes the relationship between reaction rate and particle morphology including cubic versus spherical shape and microstructure including crystalline versus amorphous structure and rate adjusting factors including salt concentration, reaction temperature, and system additives including cosolvents that stimulate particle-particle coagulation.

The instant claims read on the 1/1 ratio and only differ from the 90° C disclosed in Hu et al by fractional amounts. Hu et al specifically teaches varying the reaction parameters for the advantage of particle production efficiency. It would have been obvious to one of ordinary skilled in the art at the time of applicants invention to vary the temperatures around those disclosed in the Hu et al reference by at least fractional amounts and/or vary the other rate adjusting factors including the addition of solvents and/or the concentrations of salts for the advantage of particle production efficiency.

8. Claims 4-6, 21, 24, 36, and 45 are rejected under 35 U.S.C. 103(a) as being unpatentable over M. Z.C. Hu et al., "Nucleation and growth for Synthesis of Nanometric Zirconia particles by Forced Hydrolysis", J. of Colloid and Interface Science, 198:87-99 (1998), as applied to claims 1-3, 7-10, 12-18, 22-23, 25-29, 31-35, 37-40, 42-44, and 46-48 above, and further in view of Y. T. Moon et al., "Preparation of Monodispersed and spherical Zirconia Powders by Heating of Alcohol-Aqueous Salt Solutions", J. Am. Ceram. Soc., 78(10): 2690-2694 (1995).

Hu et al further differs from the claims in the further addition of a dispersant.

Moon (page 2693) discloses the dispersant is absorbed on the particles during particle growth. It is concluded the dispersant is added prior to or during incubation and would be absorbed at any time prior to the conclusion of particle growth which would inhibit or stop particle growth and therefore incubation.

These references are combinable because they teach formation of nanosized particles. It would have been obvious to one of ordinary skilled in the art at the time of applicants invention to add the dispersant after the conclusion of the incubation since it inhibits of agglomeration and further growth of particles.

9. Claims 34-48 and 50-51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Y. T. Moon et al., "Preparation of Monodispersed and spherical Zirconia Powders by Heating of Alcohol-Aqueous Salt Solutions", J. Am. Ceram. Soc., 78(10): 2690-2694 (1995).

Y.T. Moon discloses methods as set forth in the above anticipation rejection.

To the extent the Moon reference differs from the claims in the incubation temperature, said difference would have been obvious variations at the time of the invention and have not been shown to be critical to the invention. Merely modifying the process conditions such as temperature and concentration is not a patentable modification absent a showing of criticality. **In re Aller**, 220 F.2d 454, 105 U.S.P.Q. 233 (C.C.P.A. 1955).

Moon (page 2693) discloses the dispersant is absorbed on the particles during particle growth. It is concluded the dispersant is added prior to or during incubation and would be

absorbed at any time prior to the conclusion of particle growth which would inhibit or stop particle growth and therefore incubation.

It would have been obvious to one of ordinary skilled in the art at the time of applicants invention to add the dispersant after the conclusion of the incubation since it inhibits of agglomeration and further growth of particles.

The remaining claims are included in this rejection to the extent the variation of all parameters claimed in a single method of making particles has not been explicitly disclosed in one process said variation is within the level of one having ordinary skill in the art as a point of law. **In re Aller**, *supra*.

Response to Arguments

10. Applicant's arguments filed March 12, 2001 have been fully considered but they are not persuasive.

11. Applicants (page 11) assert a ratio by definition does not contain a unit. Applicant is correct the numeric value of a ratio does not contain a unit but the ratio is defined by the relationship the similar objects, in the instant case water and solvent, are compared. For example, the skilled artisan would not equate a molar ratio, a weight ratio, and a volume ratio. As an example acetone and water in a weight ratio of 1/1, equate to a malar ratio of 0.3[2] and a volume ratio of 0.792[3].

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[2] 1gm acetone/ 60 gm/mole / 1 gm water/18 gm/mole = 0.3

[3] 1 gm acetone * 0.792 gm/ml / 1gm water * 1.0 gm/ml = 0.792 0.792 gm/ml is density of acetone

12. Applicant (pages 11 and 12) assert the crystalline character of the nanoparticles are affected by the temperature of the incubation and the elevated temperatures correspond to cube-shaped particles and forced hydrolysis. This has not been deemed persuasive since it is not seen where the claimed processes make any distinction based on the products. Furthermore, the Hu et al (page 95) teaches increasing the incubation temperature from 90 to 100° C results in increased particle growth and the potential for forced hydrolysis instead of the amorphous hydrated zirconia. Clearly Hu et al teaches the different crystalline characteristics is temperature based and clearly contemplates 90° C as an incubation temperature. HU et al further at least suggest related temperatures of 90° C as suggested by the temperature characterizations throughout the reference which many are modified by ± 1° C. The claimed temperature range of less than 90° C is clearly within the teachings of the Hu et al reference.

Applicant (page 12) asserts the invention is directed to sphere shaped particles at lower temperatures resulting in lower incubation times and homogeneous precipitation. The Hu et al reference teaches the lower temperature nanoparticles form amorphous materials and the higher temperatures form smaller nanoparticle materials. A shorter incubation time would have been expected at lower temperatures to attain particles of the same size in view of the Hu et al teachings.

13. Applicants assert the claims no longer are anticipated. Assuming arguendo the claims are no longer anticipated, applicant has not shown the claimed processes to be unobvious.

14. Applicant (page 13) asserts the Moon et al reference teaches microwave heating to result in spherical particles and does not suggest the sol-gel processes as claimed. This has not been deemed persuasive since the Moon et al also sets forth heating in a bath or vacuum oven in the claimed temperature range.

15. Applicant (page 13) asserts their invention is not limited to powder formation but to producing a sol or gel. Applicant's claim 42 is directed to a powder and applicant makes no distinction between the sol formation and that of a powder.

16. Applicant (page 14) assert the Moon et al solvent is different than and Moon et al does not discuss the connectivity present in a porous gel network. This has not been deemed persuasive because applicant's process claims are not commensurate in scope with the arguments presented. Applicant's claimed processes may be employed to make other than the particular products argued. The organic solvent which is an isomer of those claimed (as an example see claim 8) has not been shown to be critical.

17. In conclusion the rejections are deemed proper and have been maintained.

Conclusion

18. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO

MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daniel Metzmaier whose telephone number is (703) 308-0451. The examiner can normally be reached on Monday through Friday from nine to five-thirty.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert Dawson, can be reached at (703)308-2340.

Official Papers may be submitted to **Group 1700** by facsimile transmission at (703)872-9310 and Official After Final facsimile transmissions may be submitted to **Group 1700** by facsimile transmission at (703)872-9311 in accordance with the notice published in the Official Gazette, 1096 OG 30 (November 15, 1989).

Any inquiry of a general nature or relating to the status of this application should be directed to the **Group 1700** receptionist whose telephone number is (703) 308-0661.

DSM
October 1, 2001

Daniel S. Metzmaier
Primary Examiner
Art Unit 1712